Summary of Comments of Reviewers 1-7, and USDA/APHIS Response, Regarding "White Paper: Perspective on Creeping Bentgrass, *Agrostis stolonifera* L."

There were seven reviewers of the white paper, who provided responses of one to four pages. The reviewers are numbered here in order of the increasing length of response. The responses ranged from very favorable to quite critical, sometimes with different reviewers making comments that were directly contrasting on the same topic. The following summaries of comments on each of the fourteen review questions only mention the reviewers who specifically addressed that particular question. The references cited below are given in the white paper.

Additionally, several reviewers made comments that relate to the potential deregulation of glyphosate-tolerant creeping bentgrass. The guidance to reviewers, however, was clear in stating that environmental impacts and risk assessment are beyond the scope of the white paper, which is only a support document, but that these matters would be covered through the NEPA process. In accord with the National Environmental Policy Act (NEPA), APHIS is drafting an environmental impact statement (EIS) to place information in the context of the human environment of the United States, in order to evaluate the potential effects of deregulating creeping bentgrass genetically engineered to tolerate the herbicide glyphosate. This NEPA process, which includes notice in the Federal Register, thus includes the opportunity to comment on any regulatory or policy implications of information used in the draft EIS. The folowing response, therefore, does not address comments that are beyond the specific charge for the white paper.

1. Scope and Depth

1.1. Does the document adequately review the body of scientific knowledge on the subject of *Agrostis stolonifera* biology and ecology?

1.1.1. Summary of Comments

One reviewer (6) said that the range of topics covered was relevant to the biology of the species, and the points relevant to the decisions that need to be made. Several reviewers (1,2,3,4,7) made positive statements on the white paper's comprehensive review, indicating range, breadth, depth, thoroughness, and/or exhaustive coverage of the body of knowledge about the species. One reviewer (7), however, felt that the pertinence of cited papers to major points of ecology and competitive mechanisms was sometimes ignored. For example, the reviewer said that the turfgrass strains of creeping bentgrass have very high tiller density, which needs to be considered when assessing potential invasion or contamination of mixtures. One reviewer (4) noted that there are additional species that were not mentioned, such as *Agrostis pourretii* Willd. and *Agrostis laxiflora* R. Br. Most reviewers (1,4,5,6,7) suggested that there should be additional coverage in the white paper on one or more of the following subjects: taxonomy (nomenclature, description or diagnosis, evolutionary relationships); ecology (weediness, invasiveness, naturalization, competition); conservation (natural

communities, hybridization with native species of *Agrostis*); and agronomic topics (strain and cultivar characteristics, disease resistance, agronomic systems and practices).

1.1.2. Response

Agrostis stolonifera is a species that now occurs commonly worldwide in temperate regions and is utilized extensively, so the purely scientific and applied literature with information about this species and its relatives is vast. The white paper was not intended to be a monograph, but to provide a basic understanding of the species and a guide to relevant literature for a broad range of readers, thus indicating parameters and dimensions of knowledge that might be useful for an environmental consideration of the species. As such, it is inherent that many topics are briefly characterized, in a sense only setting the stage and introducing the characters, that is only providing a springboard into the extensive literature for diverse readers.

For example, the white paper did not focus on the agronomic context, but on non-agronomic information on *Agrostis stolonifera* and its relatives that had not previously been consolidated. Subsections 3.1-3.2 of the white paper state that this species is quite phenotypically plastic (adjusting locally) and evolutionarily adaptive, and portray how these capabilities are so in a wide range of environments. This information sets the stage for considering the inherent capacity of turf strains and their hybrids to fine-tune or spread vegetatively in a diversity of different environments. For example, Table 2 states that the varied vigor of ×*Agropogon lutosus* hybrids may result from hybridization with different ecotypes of *Agrostis stolonifera*.

The forthcoming taxonomic treatment of *Agrostis* in the definitive *Flora of North America* will provide descriptions and a key to identify the species in the United States and Canada (the Harvey 2004 manuscript of this treatment is cited). Section 1 of the white paper provided a worldwide taxonomic overview and cited definitive taxonomic references for *Agrostis* in several other regions, for example Tutin (1980) for Europe, where the agronomic species are native. The additional *Agrostis* names mentioned by one reviewer (4) are from a Finnish website. *Agrostis pourretii* is a species that ranges from southern Europe to northern Africa and Macaronesia, whereas the name "*Agrostis laxiflora* R. Br." is scarcely used and apparently regarded as a synonym (*sensu* R. Br.) of *Agrostis clavata* Trin. (*e.g.*, Tzvelev 1983; Kharkevich *et al*. 2003). The species *Agrostis pourretii* is not free-living in the New World, and the name "*Agrostis laxiflora* R. Br." is not used in the New World. The cited book by Soreng *et al*. (2003) provides a checklist and definitive nomenclature for all of the native and naturalized New World species of *Agrostis*.

1.2. Are any significant references omitted?

1.2.1. Summary of Comments

Two reviewers (1,2) believed that no significant references were omitted, whereas two reviewers (5,6) suggested potentially useful references on the reproductive biology of

grasses and other plants or on the weediness of *Agrostis stolonifera*. One reviewer (7) felt that there were "heaps" too many citations that did not have their inclusion justified. However, another reviewer (2) recommended that the white paper be shared with Federal regulatory agencies as a demonstration of the extensive information resources that are available for utilization in such activities as "prior art" searches.

1.2.2. Response

APHIS considers this criterion to have been satisfied, in view of the range of reviewers comments, and the purpose of the white paper.

2. Currency

2.1. Does the document reflect current scientific thinking on the subject?

2.1.1. Summary of Comments

One reviewer (3) distinguished between making a summary of scientific *knowledge* and of scientific *thought*, considering the latter outside the scope of the white paper, while stating that the white paper did reflect factual conclusions. Most reviewers (1,2,3,4,6,7) indicated that they believed the white paper reflected the current scientific knowledge on the subject.

2.1.2. Response

APHIS considers this criterion to have been satisfied.

2.2. Are references cited that are superseded by more recent literature?

2.2.1. Summary of Comments

One reviewer (5) said that there seemed to be few more recent references available and nothing that would supersede the current review.

2.2.2. Response

APHIS considers this criterion to have been satisfied.

3. Clarity and Focus

3.1. Is the purpose of the document clear?

3.1.1. Summary of Comments

Several reviewers (1,4,7) said that the white paper needed a statement of purpose, two reviewers (5,6) said that the purpose was clear, and one reviewer (3) said that the purpose

was clear because of the accompanying materials (*i.e.*, the guidance and questions for reviewers).

3.1.2. Response

The "Peer Review Plan" that accompanied the posting of this OMB-type peer review on the USDA/APHIS website provided the background and context for the white paper, and further information was provided in the APHIS guidance to reviewers. However, we agree that as a stand-alone document, the white paper did not indicate its purpose. Consequently, a brief introduction has been added to the white paper, linking it to these documents, and stating that the white paper provides an overview of the biology and ecology of *Agrostis stolonifera* and its relatives in the United States and Canada.

3.2. Are any sections vague or ambiguous?

3.2.1. Summary of Comments

One reviewer (6) felt that the white paper was well organized, read well and no sections were vague or ambiguous, another (5) that the text was generally quite clear, another (3) that it was well written and in general clear, but one reviewer (4) felt that it was poorly written. One reviewer (7) recommended that definitions be provided for the concepts native, introduced, naturalized, and weed, and in addition recommended the removal of vague words, considering them to increase scientific uncertainty. One reviewer (2) felt that the white paper synthesized scientific conclusions in a very concise and interpretable manner, and that, even though the taxonomic complexities of creeping bentgrass are daunting even for experts, taxonomic relationships and problems were compiled and explained in a very understandable fashion. Another reviewer (7) indicated that a fine job was done in explaining the species relationships. However, a reviewer (4) felt that confusion remained in the referencing and naming of species with little clarity as to their distinctness, with the white paper making reference to citations rather than deciphering the relationships. One reviewer (1) suggested that a numbering system for the many references would make the white paper more readable.

3.2.2. Response

APHIS recognizes the unusual effort required for readers to integrate the citations as referenced into their reading of the entire text. Nonetheless, since there is such a wealth of diverse literature on the subject progressing through many decades, this approach is considered the best way to bring the reader quickly into a depth of familiarity with the subject matter and perspective on the species. APHIS believes that generalities rather than technical exactness were sometimes required. The white paper was not intended to be a comprehensive scientific treatise for a specialized audience. The four concepts noted above were applied as they are commonly understood, and several basic references were cited for definitions as well as scientific discussions of the terms. All four terms require some geographic context, and they also bring in a diversity of issues regarding land use and management. Thorough consideration of an array of environments and

situations, therefore, would be needed to bring these definitions and concepts into application as they relate to the extensive distribution and habitats of these species in the United States. APHIS is aware that scientific and technical information sometimes cannot be simplified without loss to some readers, which might increase their uncertainty. APHIS has carried out some editing to strive for more clarity and make the white paper as user-friendly as possible for a wide range of experts and non-specialists.

4. Accuracy

4.1. Is any information in the document factually incorrect?

4.1.1. Summary of Comments

One reviewer (4) stated that the white paper's accuracy is not in question assuming that we [readers] accept all the referenced materials as being accurate. Two reviewers (3,6) indicated that within their knowledge they considered the white paper factually correct. One reviewer (7) provided detailed information and discussion indicating that the white paper was incorrect in its brief presentation of a study by Wipff and Fricker (2001).

4.1.2. Response

APHIS partially agrees with the reviewer (7) comment, as the text did not clearly state that intraspecific as well as interspecific crossing were being addressed. APHIS does not agree that they studied introgression (*i.e.*, recurrent backcrossing). Wipff and Fricker (2001) extrapolated (by calculation) from their data on crossing to sentinel plants, and estimated that pollen could travel 4,296 feet and result in intraspecific crossing at a 0.02% level. To make this information clear, subsection 6.7 has been revised to provide a less-brief summary. As the white paper is a selected assessment and integration of relevant literature, not simply an indiscriminant compilation of references, APHIS believes that the contents of the references are substantively accurate.

4.2. Does the document accurately characterize the content of references cited?

4.2.1. Summary of Comments

One reviewer (5) felt that the white paper did not sufficiently characterize the importance of *Agrostis stolonifera* as an exotic species, quoting sentences from the cited paper Gremmen *et al*. (1998) and stating that thus the invasive species had a fairly major impact on the studied island ecosystem. One reviewer (7) felt that as Sauer (1942) noted early colonial use of English grasses but did not mention *Agrostis*, it did not support the supposition that *Agrostis capillaris* likely was present in New England by the mid-17th century.

4.2.2. Response

Subsections 7.1-7.5 of the white paper and its Table 1 provide some information and many references on weediness or invasiveness of *Agrostis stolonifera* and hybridizing relatives in some situations. Subsection 7.1 stated that creeping bentgrass is "rarely aggressively invasive (*i.e.* transformative) (Pyšek *et al*. 2004) in natural or semi-natural areas (as on … several sub-Antarctic islands … Gremmen *et al*. 1998 …)", and Table 1 indicates that it is a moderate invasive threat on the California coast in wetlands (Dudley 1998). However, to elaborate on invasiveness or weediness (*e.g.*, extent, past and current likelihood, consequences), particular environments and actual situations need characterization and analysis. Detailed presentation of land-use objectives (*e.g*., parkland, rights-of-way, grazing, cropland), vegetation composition and structure, and management practices (*e.g*., herbicide usage) for the specific regions, localities, or sites are needed, thus going well beyond a general scientific overview.

In subsection 5.4 of the white paper, APHIS considers the cited references Sauer (1942) coupled with Cronon (1983) to be good support for the white paper's conjecture of when *Agrostis capillaris* was introduced. We do not agree with the reviewer's characterization of very little colonial attention to grass species, but recognize that familiarity with the considerable early botanical, geographic, agricultural, and historical literature would be necessary to reach firm conclusions. The key point remains clear that the species has been present in the United States for a few centuries rather than a few decades, which helps to explain its appreciable naturalization.

4.3. Are conclusions and summary statements drawn in the document scientifically justified?

4.3.1. Summary of Comments

Several reviewers (1,2,3) noted that there were few opinions stated or conclusions drawn. Two reviewers (3,6) indicated that summary statements appeared to be scientifically justified. One reviewer (5) felt that the white paper did not fully portray the importance of *Agrostis stolonifera* as an exotic invasive species. One reviewer (2) pointed out that it was left to the reader to make inferences from the facts given.

4.3.2. Response

APHIS considers this criterion to have been satisfied and this approach successful for the intended objective of providing a general scientific overview.

4.4. Does the document clearly identify significant areas of scientific uncertainty on the subject?

4.4.1. Summary of Comments

One reviewer (6) said the white paper clearly highlighted areas of scientific uncertainty of the subject. Some reviewers (1,7) said significant areas of scientific uncertainty either were not or were inadequately identified. One reviewer (5) felt that the criterion was met except for indicating unknown risks of hybridization with native species in the invasive range of *Agrostis stolonifera*. Another reviewer (3) said the white paper provided a thorough review of what is known and not known about *Agrostis stolonifera,* and did not gloss over the complexities of the genus nor the amount that we do not know, but noted his/her preference that what is not known would have been emphasized because it is the unknown that leads to unforeseen problems.

4.4.2. Response

APHIS agrees that areas of scientific uncertainty were not emphasized, because the purpose of the white paper was not to directly advance scientific knowledge or to point out areas for future research. The focus of the white paper was the accepted body of relevant scientific knowledge on the species. Since the white paper is not a risk analysis, it is not a suitable vehicle to place appropriate uncertainty in a particular environmental context.

With regard to *Agrostis stolonifera* hybridization with native species, what is known was presented in Tables 1 and 2 and Figure 1. Table 2 pointed out some uncertainties regarding hybridization with native *Agrostis* species, whereas the discussion focused on the introduced species because that is the information known. Detailed discussion about the potential for hybridization with rare or other native *Agrostis* species would go beyond the intention and scope of the white paper.

5. Objectivity

5.1. Does the document present the body of scientific knowledge on this subject in a fair, objective manner?

5.1.1. Summary of Comments

One reviewer (4) stated that the underlying importance of the *Agrostis* species is evident in the varied environments that the various members of the genus have adapted to. Most reviewers (1,2,3,5,6) indicated that the white paper was unbiased, fair, objective, and/or non-judgmental. One reviewer (7) stated that the white paper did not meet this criterion because it inadequately presented some kinds of data such as quantitative data and was weak in the areas of ecology and competitive interrelationships between *Agrostis stolonifera* and other species.

5.1.2. Response

APHIS believes that this criterion has been satisfied, and that a lack of considerable quantitative data did not distort the information given in the white paper. The available data are often so context-specific that extrapolation would be of little general use when

considering the diverse environments and many habitats of this widespread and versatile species. Thus including more quantitative information in the areas of ecology and competitive interrelationships as desired with the examples of the reviewer (7) would radically change the intrinsic character of the white paper. Considerable detail would be needed on the ecology of creeping bentgrass in relation to land management in various areas and situations in the United States.

5.2. Are references selectively cited or discussed in such a way as to introduce bias into the document?

5.2.1. Summary of Comments

Two reviewers (2,6) said there was no apparent bias or evidence of selective citation or discussion. One reviewer (5) was concerned about unintentional bias from a conservation standpoint in not fully addressing and portraying impacts or risks of *Agrostis stolonifera* as an exotic invasive species. Another reviewer (7) stated that the white paper needed to provide an adequate quantitative understanding of ecology and competitive mechanisms in order for readers to avoid reaching biased interpretations.

5.2.2. Response

The white paper emphasizes that *Agrostis stolonifera* is a robust species that occurs in a wide diversity of habitats and situations, and furthermore that it adjusts and is modified by those contexts. Some characteristics of creeping bentgrass that make it so useful on golf courses also make it quite successful in non-agronomic situations. In consequence, inevitably presentation of details of ecology, competition, weediness, and invasiveness of the species, whether quantitative or not, requires thorough characterization of the area, and the management objectives for that locality. APHIS thus agrees that in particular cases quantitative information can help clarify what is known and what uncertain, and in addition what can be technically addressed, and what requires other judgments.

5.3. Are judgments the author makes regarding scientific uncertainty reasonable?

5.3.1. Summary of Comments

One reviewer (3) stated that the white paper was “painfully objective” and the author non-judgmental. Another reviewer (2) found it to be “aseptically clean” of opinion, and viewed this absence of position not to be a problem for the white paper, but that it would be for any future publication in a scientific journal.

5.3.2. Response

The intent of the white paper was to present a focused general guide to what is known, with minimum interpretation of information and conclusions found in the literature.

6. Does this White Paper accurately and objectively assess current scientific knowledge on *Agrostis stolonifera*? Please select one of the following responses:

(1) Yes, subject to minor editorial changes (if any).

Explicitly chosen by two reviewers (1,6).

(2) Yes, but only after revisions have been made to address specific weaknesses.

Explicitly chosen by two reviewers (4,7).

(3) No, this White Paper has significant shortcomings in its assessment of current scientific knowledge on *Agrostis stolonifera*.

Not chosen by any of the remaining three reviewers, who did not respond explicitly.

6. Concluding Response

APHIS appreciates the thoughtful comments of the seven reviewers, and some revisions to the white paper have accordingly been made. APHIS concludes that the white paper objectively and accurately assesses current scientific knowledge on *Agrostis stolonifera*.

The revised and updated white paper is posted on the USDA/APHIS website, at http://www.aphis.usda.gov/about_aphis/printable_version/cbg_wpFinal.pdf